

VERSION WITH MARKING TO SHOW CHANGES MADE
IN THE SPECIFICATION

Background of the Invention

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5 Field of the Invention

The invention relates to an image sensor module, and more particularly to an image sensor with increased product reliability and facilitated manufacturing processes.

Description of the Related Art

10 Referring to FIG. 1, which is a cross-sectional view showing an image sensor package, the image sensor includes a plurality of lower metal sheets10 arranged in an array, each of the lower metal sheets10 having an upper surface26 and a lower surface28. A plurality of upper metal sheets12 arranged in an array, each of the upper metal sheets12 having an upper surface38 and a lower surface40,
15 the lower surfaces 40 of the upper metal sheets 12 being stacked on the upper surfaces 26 of the lower metal sheets10. An encapsulant14 is for encapsulating the lower metal sheets10 and the upper metal sheets12. Wherein the upper surfaces38 of the upper metal sheets12 are exposed from the encapsulant14. The lower surfaces28 of the lower metal sheets10 are exposed from the encapsulant14 and
20 electrically connected to the printed circuit board 32 through tin 30 by the way of surface mount technique (SMT), and the encapsulant14 is formed with a frame layer16 around the upper surfaces38 of the upper metal sheets12 to define a

chamber⁴² together with the upper metal sheets¹². A photosensitive chip¹⁸ arranged within the chamber. The plurality of wires ²⁰ is for electrically connecting the photosensitive chip¹⁸ to the upper surfaces³⁸ of the upper metal sheets¹². A transparent layer²² arranged on the frame layer¹⁶ of the
5 encapsulant¹⁴ to cover the photosensitive chip¹⁸.

The above-mentioned the patent has some advantages, but it has following drawbacks.

1. Since the wires ²⁰ are electrically connected the chip¹⁸ to the upper surface³⁸ of the upper metal sheets¹² for transmitting signals from the chip¹⁸ to
10 the lower metal sheets¹². Thus, the upper metals¹² and the lower metal sheets¹⁰ much be tight stacked.

Summary of the invention

An object of the invention is to provide an image sensor with improved package reliability.

15 Still another object of the invention is to provide an image sensor, wherein the wire bonding process may be easily performed and the product yield may be increased.

To achieve the above-mentioned objects, the invention includes plural lower metal sheets, plural upper metal sheets stacked on the lower metal sheets, and an
20 encapsulant for encapsulating the lower and upper metal sheets. The lower metal formed with a first hole, the upper metal sheets formed a second hole penetrated

from the upper surface to the lower surface. Wherein the encapsulant filled into the second hole and first hole to tighten the upper metal sheets and the lower metal sheets. A photosensitive chip arranged within the chamber, plural wires for electrically connecting the chip to the upper surfaces of the lower metal sheets,
5 and a transparent layer arranged on the frame layer to cover the chip.

Brief description of the drawings

FIG. 1 is a cross-sectional view showing an image sensor package.

FIG. 2 is a cross-sectional view showing an image sensor package of the invention.

10 FIG. 3 is a first schematic view showing an image sensor package of the invention.

FIG. 4 is a second schematic view showing an image sensor of the invention.

FIG. 5 is a third schematic view showing an image sensor package of the invention.

15 DETAILED DESCRIPTION OF THE invention

Referring to FIG. 2, an image sensor of the invention includes a plurality of lower metal sheets 46 arranged in an array, a plurality of upper metal sheets 48 arranged in an array, an encapsulant 50, a frame layer 52, a photosensitive chip 54, a plurality of wires 56, and a transparent layer 58.

20 Please referring to FIG. 3 and FIG. 4, Each lower metal sheet 46 has an upper

surface 60 and a lower surface 62; and formed with a first hole64, which is a cavity.

Each of the upper metal sheet48 has an upper surface68 and a lower surface70, and formed with a second hole 72 penetrated from the upper surface68
5 to the lower surface70. The lower surfaces70 of the upper metal sheets48 are stacked on the upper surfaces60 of the lower metal sheets46, then the second hole72 corresponding with the first hole64.

The encapsulant54 is encapsulated the lower metal sheets 46and the upper metal sheets 48 via integrated mold, and filled into the first hole64 and the second
10 hole 72to tighten the lower metal sheets46 and upper metal sheets48. Wherein the upper surfaces60 of the lower metal sheets46 are exposed from the encapsulant54. The lower surfaces62 of the lower metal sheets46 are exposed from the encapsulant54 and electrically connected to the printed circuit board32 via solder30. The encapsulant54 is formed with a frame layer52 around the upper
15 surfaces68 of the upper metal sheets48 to define a chamber74 together with the upper metal sheets48.

The photosensitive chip 54 is arranged on the middle board 67 and located within the chamber 74.

The plurality of wires 56 are electrically connected the photosensitive chip
20 54 to the upper surfaces 60 of the upper metal sheets 46 so as to transfer signals from the photosensitive chip 54 to the lower metal sheets 46.

The transparent layer 58 is a piece of transparent glass arranged on the frame layer 52 of the encapsulant 50 to cover the photosensitive chip 54. Thus, the photosensitive chip 54 may receive optical signals passing through the transparent layer 58.

5 The invention has the following advantages.

3. Since the combination of the upper and lower metal sheets 48 and 46 is thicker, the solder 30 may climb to the upper metal sheets 48 from the lower metal sheets 46 during the SMT process for mounting the image sensor to the printed circuit board 32. Therefore, the package body can be
10 mounted to the printed circuit board 32 with great stability.

4. Since the encapsulant 54 is filled into the first hole 64 and first hole 72, so as to the upper metal sheets 48 and lower metal sheets 46 may package tight.

While the invention has been described by way of examples and in terms of
15 preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. To the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.